Medical Officers of Schools Association.

8

A Preliminary Inquiry Concerning the Milk Supply of Schools

BY

C. E. SHELLY

M.D. Cantab.; M.R.C.P. (Lond.)

Consulting Medical Officer, Haileybury College

ISSUED BY

THE MEDICAL OFFICERS OF SCHOOLS ASSOCIATION

LONDON

J. & A. CHURCHILL

7 GREAT MARLBOROUGH STREET

1905

A PRELIMINARY INQUIRY

CONCERNING

THE MILK SUPPLY OF SCHOOLS.

The inquiry, of which the returns are analysed in the following pages, was the outcome of a paper read before the Medical Officers of Schools Association, by Dr. Christopher Childs, on the subject of safeguarding the milk supplies of schools. In that paper the Association was urged to formulate certain recommendations which, it was suggested, should be pressed upon the authorities of all schools; and of these recommendations, the most important, because the most debatable, was, in effect, the institution of some method of sterilising the milk delivered on the school premises before that milk was distributed for consumption.

Upon consideration of the matter, it was felt by the Council that, before tendering to the Masters and Governing Bodies of all our large schools urgent advice, which was, indeed, based upon weighty arguments founded on a long array of very significant investigations, but which would, in its adoption, almost certainly meet with a certain amount of at least passive opposition, it was desirable that we should be in a position to meet the kind of plausible argument which was practically certain to be advanced by those whose faith in the arrangements still generally in force had not yet been shaken.

A Headmaster might say:—"You have made out a strong case, on paper at all events, and the matter is certainly not one to be lightly put aside as of no importance. But tell me, in connection with the serious

risks which, as you claim to have shown, do beset us every day of every term, what are the facts as regards the actual amount of school illness traceable to infection conveyed by milk? I have known the life of my school for such and such a number of years; we have had from time to time epidemics of such and such diseases; but they have all (or almost all) been ascribed to personal infection, the details of which appeared at the time to be quite clearly established. Our Medical Officer tells us that neither he nor the Medical Officer of Health for the district has been able to trace any of this illness to the milk. Are we a fortunate exception to a general rule; and, if so, to what extent are we exceptional? I must know how we stand in this relation before I can feel justified in altering a system which seems hitherto not to have failed us; and in substituting for it some method of treating the milk, which, apart from any question of expense, may excite a discontent so pronounced as to make it almost impracticable; for, if my boys have not acquired a tolerance of boiled milk at home, they will emphatically condemn it at school; and I may, like some of my colleagues, be compelled to discard it. Further, what are the results achieved in those schools in which milk is sterilised, as compared with those in which it is drunk *au naturel*? I mean, what is the statistical evidence as to comparative immunity?"

Now, to such questions, we were prepared with practically no detailed and convincing answers. It was in the hope that such might be forthcoming, one way or the other, that the annexed letter and form of inquiry were sent to each member of the Association: and it is the replies to these which it it is now endeavoured to summarise.

ENCLOSURE.]

MEDICAL OFFICERS OF SCHOOLS ASSOCIATION.

DEAR SIR,—We herewith forward to you a reprint of the suggestive paper recently read before the Association by Dr. CHRISTOPHER CHILDS. But, while recognising the importance of securing the purity of the milk supplied in every case (*vide* the Association's *Code of Rules*, p. 18, paragraph V.), the Council is not cognisant of any mass of direct evidence to the effect that Schools have suffered from outbreaks, large or small, of illness which have been proved to be due to infection conveyed by milk. It is obviously of some import-

ance that information on this matter should be available, if possible, both in relation to the position of the school authorities themselves and in relation to the general views propounded by Sanitarians—as well as to the fears not rarely entertained by parents.

The Council will be greatly obliged if you will kindly aid them in the endeavour to throw some further light on this side of the question by filling in answers to the accompanying queries and returning your reply in the stamped and addressed envelope which is enclosed for the purpose. It is to be clearly understood that any such information as you may be able to supply will be used for statistical purposes *only*, and that it will not be employed in any such way as might permit of its identification with your School.

The favour of an *early reply* to this request will be much appreciated.

MEDICAL OFFICERS OF SCHOOLS ASSOCIATION.

Kindly fill in answers to the questions given below, and return your reply in the enclosed envelope at your early convenience.

A. Source of your School Milk Supply :—

School Dairy and Farm?	Dairy Farm under direct supervision of the School?	General : *i.e.*, independent of School supervision?

B. Are any precautions adopted with regard to the Milk supplied to the School :—

In transit?	On the School premises (as, *e.g.*, by boiling)?

C. Number of cases in which Disease amongst the members of your School population has been traced to Milk-Infection :—

Enteric Fever.	Diphtheria.	Scarlatina.	Tuber-culosis.	Diarrhœa.	Septic Sore Throat.

D. The above observations cover a period of ..... Years.

E. Average number of Pupils in the School ? .....

F. Average Age of Pupils ? .....

School .....

Name .....

Date .....

In response to more than one hundred circulars of questions issued, 43 replies in all—one from the University of Oxford—have been received. The disparity is largely to be accounted for by the fact that many of our members are attached as Medical Officers to Schools in which all or most of the pupils are day scholars, and to similar causes.

Small as is the total number of replies, they may be taken as representative ; covering, as they do, Schools varying in social class, in numbers ranging from 24 to nearly 1,000 pupils, of ages varying from 4 years to 19½ ; and the several returns cover periods of from 2 to 37 years—the average being 18·2 years.

The 41 schools tabulated contain, on the average, in each year 10,519 scholars altogether ; the number of pupils multiplied by the number of years covered by the several observers totals 203,385—which may be expressed as the total number of annual pupil-observations included in the whole return. If we assume that each of the pupils remained at school for 6 years—a far too liberal estimate—then it will be quite safe to say that the returns altogether include observations of fully 33,894 separate individual pupils, extending over an average of more than 18 years.

As regards the cases of illness recorded, I should say at once that I have not taken into statistical consideration

TABULATION

OF RETURNS TO ENQUIRIES REGARDING SCHOOL MILK SUPPLIES.

School Number.	Average No. of Pupils.	Observed for Years.	Total Annual Pupil-Observations.	Ages at Entrance and at Leaving.	Average Age.	School Dairy Farm.	School Supervision.	General source of Milk-supply (not under School Supervision or Inspection.)	Precautions adopted in Transit.	Precautions adopted on Premises.	Enteric.	Diphtheria.	Scarlatina.	Tuberculosis.	Diarrhœa.	Sore Throat.
1	24	25	600	5–14	$8\frac{6}{12}$	—	—	G.	—	—	—	D.1 §	—	—	—	—
2	25	25	625	13–17	15	—	—	G.	—	—	—	—	—	—	—	—
3	45 girls	25	1,125	13–17	15	—	—	G.	—	—	—	—	—	—	—	—
4	50 girls	25	1,250	13–17	15	—	—	G.	—	—	—	—	—	—	—	—
5	60	25	1,300	5–14	$8\frac{6}{12}$	—	—	G.	—	—	—	—	—	—	—	—
6	35	2	70	—	13	—	—	G.	—	Sterilised for 5′ at 200° F.	—	—	—	—	—	—
7	30	4	120	10–14	12	—	S. s.	—	—	—	—	—	—	—	—	—
8	40	4	160	10–14	12	S. Dy. F.*	—	—	—	—	—	—	—	—	—	—
9	40	27	1,080	10–18	14	—	—	G.	—	Boiled.	—	—	—	—	—	—
10	85	21	1,785	10–18	14	—	—	G.	—	Boiled.	—	—	—	—	—	—
11	45	30	1,350	10–19	$14\frac{6}{12}$	S. Dy. F.	—	—	—	—	—	—	—	—	—	—
12	50	24	1,200	—	15	—	—	G.	—	Boiled.	—	—	—	—	—	—
13	50	6	300	6–14½	$10\frac{3}{12}$	—	—	G.	—	Boiled.	—	—	—	—	—	—
14	75	10	750	6–16	11	—	—	G.	—	—	—	—	—	—	—	—
15	100	5	500	10–17	$13\frac{6}{12}$	S. Dy. F.	—	—	—	—	—	—	—	—	—	—
16	145	10	1,450	—	13	—	—	G.	—	Was so-called "boiled" for about one year.	—	—	—	—	—	—
17	150	20	3,000	9–17	13	—	—	G.	—	Boiling tried: complaints, cream then added.	—	—	—	—	—	—
18	160	25	4,000	7–14	$10\frac{6}{12}$	—	—	G.	—	Raw milk very seldom given by itself; 5 oz. *per diem* in Coffee or Cocoa.	—	—	—	—	—	—
19	160	10	1,600	11–18	$14\frac{6}{12}$	S. Dy. F.	—	—	—	—	—	—	—	—	—	—
20	180	30	5,400	12–18	15	—	—	G.	—	—	E. 20 ‖	—	—	—	—	—
21	200	10	2,000	10–18	14	S. Dy. F.	—	—	—	Boiled.	—	—	—	—	Dh. 50 **	S. Th. 35 ††
22	200	12	2,400	14–19	$16\frac{5}{12}$	—	—	G.	—	Occasionally and partly boiled	—	—	—	—	—	—
23	200	25	5,000	14–15	$14\frac{6}{12}$	—	—	G.	—	Boiled.	—	—	—	—	—	?S Th many
24	220	10	2,200	—	15	—	—	G.	—	—	—	—	—	—	—	—
25	250	25	6,250	—	15	—	—	G. 6	—	—	—	—	—	—	—	—
26	250	11	2,750	—	13	—	—	G.	—	Boiled.	—	—	—	—	—	—
27	265	19	5,035	—	16	—	—	G.	—	Boiled (in some houses).	—	—	—	—	—	—
28	265	18	4,770	15½–16	$15\frac{8}{12}$	—	—	G.	—	—	—	—	—	—	—	—
29	300	2	600	—	15	—	—	G. 2	—	—	—	—	—	—	—	—
30	315	18	6,300	—	$18\frac{6}{12}$	—	—	G.	Special cans	Kept in Dairy Room.	—	D.10 ¶	—	—	—	—
31	350	20	7,000	—	14	—	—	G.	—	—	—	—	—	—	—	—
32	400	25	10,000	—	15	—	—	G.†	—	—	—	—	—	—	—	—
33	400	37	13,800	14–18½	$15\frac{6}{12}$	—	S. s.	G.	—	—	? E. 1	—	—	—	—	—
34	450	17	7,650	—	15	—	—	G.**	—	Occasionally boiled, if epidemics in neighbourhood.	—	—	—	—	—	—
35	450	30	13,500	13–19	16	—	—	G.	—	—	—	—	—	—	—	? S. Th. ‡‡
36	550	17	9,625	12–19	$15\frac{6}{12}$	—	—	G. 3	Covered cans	Boiled in some houses.	—	—	—	—	—	—
37	600	15	9,000	12–19	$15\frac{6}{12}$	—	—	G.‡	—	—	—	—	—	—	—	—
38	650	30	19,500	—	13	—	—	G.	—	Boiled for some years past.	—	—	—	—	—	—
39	680	7	4,760	4–16	10	—	—	G.	—	Heated to 165° F. for 35′.	—	—	—	—	—	—
40	990	15	14,880	13–19½	$15\frac{8}{12}$	—	—	G. 14	—	Boiled in some houses.	—	—	—	—	—	S. Th. 40
41											—	—	—	—	—	—
42	990	30	29,700	11–15$\frac{5}{12}$	$13\frac{8}{12}$	—	—	G.	—	Raised to 212° F. in a Jacketed Copper.	—	—	—	—	—	—

* All cows tested with Tuberculin. † Inspected by M.O.H. to School. ** Inspected. ‡ Open to inspection. ‖ Traced to cream. § Imported. Traced to milk other than that supplied to school.
¶ Milk obtained from another farm. ** Cows eating acorns. †† When getting milk from public dairy. ‡‡ One epidemic outbreak.

those preceded by a " ? " because such stand in each case for a statement of this type :—"No cause could be ascertained; in the absence of other origin the milk was suspected : but we could discover no evidence in proof." And, indeed, when a single case of typhoid is " suspected " to be due to a milk supply common to some 400 boys, the suspicion does not attain statistical importance.

It will be noted that there are recorded, as definitely due to milk-conveyed infection, 11 cases of diphtheria. But, as one of these was " imported " (*i.e.*, though due to milk did not originate in the school or the school milk), I have thought it only fair to exclude it from the total of illness due to defects of school milk supplies.

Again, the two instances in which " ? many cases of sore throat " and " an epidemic outbreak of sore throat " are doubtfully attributed to the "milk " as a *dernier resort* cannot fairly be included in the total of that column.

No case of scarlatina or of tuberculosis (cf., *age* on admission — *e.g.* 4 and 6) is recorded as due to milk-infection.

As regards Sources of milk supply. Five schools have their own school dairy farms, and in one of these all the cows are subjected to the tuberculin test. One also boils the milk when received on the school premises. One school relies upon special supervision and control of a dairy farm not its own; and another impairs the value of this precaution by mixing the milk from the farm under its direct supervision with other milk obtained from general outside sources. The remaining thirty-five schools obtain their milk from " general " sources (in one instance from as many as fourteen different sources), and of these all but fourteen practise some sort of precaution, more or less effective, with the view of protecting the consumer against infection. These precautions will be classified more definitely presently.

The general result of the inquiry may be briefly stated thus :—In connection with all the 41 schools, representing 203,385 yearly observations on some 33,894 individual pupils whose ages ranged from 4 to 19½ years, there are reported to have occurred through milk supplied to the schools :—

Disease.	Cases.	Per cent. per annum.	Percentage of pupils.
Enteric ..	20	·00098	·0059
Diphtheria ..	10	·00049	·0029
Diarrhœa ..	50	·00245	·0145
Sore Throat	75	·00367	·0217

Sub-Group A.—Schools in which Special Precautions are taken, including tuberculin test, 1. Sterilisation of milk on the school premises, 3. Boiling of milk on school premises, 8.

[Note: Tuberculin test may ensure protection against tuberculosis, from which *all* the schools are returned as exempt. It does not profess to protect against the other maladies, and no boiling or sterilisation is employed as well. Average age of pupils in this school, 12 years (10 to 14.)]

Twelve Schools—Nos. 6, 8, 9, 10, 12, 13, 21, 23, 26, 38, 39, 42. Ten of these obtain their milk from "general" sources, but boil or sterilise it on the premises. Two have their own school dairy farms. In one of these the cows on the farm are tested; in the other the milk is boiled on the premises. Only one school, which has its own dairy farm and also boils the milk, makes any return of illness traceable to milk—viz., 50 cases of diarrhœa (attributed to the cows having eaten acorns), and 35 cases of sore throat (which occurred while the milk was being supplied from a source other than the school's own dairy farm). This would seem to show that the boiling of such milk does not destroy the toxin, ferment, or irritant which makes acorns an injurious addition to the human dietary, or prevent the occurrence of every form of the milk poisoning which produces epidemic sore throats.

Taken as a group, these 11,408 pupils, representing 68,455 yearly observations, make the following return of illness due to milk-infection:—

Disease.	Cases.	Per cent. per annum.	Percentage of pupils.
Diarrhœa ..	50	·0073	·043
Sore throat..	35	·0051	·036

The average age of the pupils is 13 years (4 to 18).

Moreover, in one school (No. 23) in which milk supplied from a general source is boiled on the school premises, "many" cases of epidemic sore throat are doubtfully attributed to milk-infection.

Sub-Group B.—Special Precautions taken, but only *partial* in their character or in their application, including occasional or partial boiling of milk on the school premises, supervision of the sources of supply by the school, or inspection of the same by the school Medical Officer of Health. Three schools obtain their milk from a "general" source, subject to school supervision or inspection; 6 get the milk from a "general" source, and boiling on the premises is or

was occasionally resorted to; 1 in which milk from a "general" source is boiled, and then (? raw) cream added; 1 in which milk from a "general" source is conveyed to the school in "special cans," and then stored in a dairy-room on the premises; 3 schools have their own school dairies; 1 school obtains its milk partly from a farm under its own supervision and partly from a "general" outside source. These 15 schools include Nos. 7, 11, 15, 16, 17, 19, 22, 27, 30, 32, 33, 34, 36, 37, 40 and 41, and represent 14,519 pupils, corresponding to 87,110 yearly observations.

The cases of illness traced to milk-infection work out as:—

Disease.	Cases.	Per cent. per annum.	Percentage of pupils.
Diphtheria ..	10	·0011	·0068
Sore throat..	40	·0044	·0272

Sub-Group C.—No special precautions taken; milk obtained from "general" outside source:—Fourteen schools —Nos. 1, 2, 3, 4, 5, 14, 18, 20, 24, 25, 28, 29, 31, 35—representing 8,161 pupils and 48,970 yearly observations. Average age of pupils, 13 $\frac{6}{12}$ (5 to 19).

The illness traced to milk-infection is returned as:—

Disease.	Cases.	Per cent. per annum.	Percentage of pupils.
Enteric ..	20	·00408	·0244

This group of 20 typhoid cases seems to have been clearly traced to the eating of strawberries and *cream* at a shop belonging to the dairy farm which supplied the school—which shop was shown at the time to be the source of several other cases of the disease in the town. It is noteworthy that the *milk* supplied from the same dairy to the school does not seem to have given rise to illness. And the direct implication of the *cream* is a significant comment on the course followed at one school (No. 17) in Sub-Group B, in which the taste of the boiled milk is covered by the addition of cream. The relatively excessive virulence of *cream* obtained from milk infected with the *B. typhosus* seem to be at least strongly suggested by accumulating observations. What is the explanation? Does the cream, in rising to the surface of the milk, carry up the bacilli entangled in it? Is the cream—on the surface of the milk—especially liable to aërial contamination—and, if so, why more than the milk itself—*e.g.*, skim milk? Does the *B. typhosus* multiply with excessive rapidity or acquire greater virulence in cream as compared with milk? Or is its growth in numbers or potency, or in both, specially favoured by being exposed to air while

resident in this culture-medium? Again, given infected milk, what reputation is deserved by *cheese* made therefrom; and does infected cream gain or lose in virulence when churned into *butter?* How do similar considerations apply to milk (and its products) infected by other pathogenic microbes (*e.g.*, diphtheria, scarlatina, septic sore throat)? Precise information on these points would be extremely valuable.

One of the above schools (No. 35) also doubtfully attributes an "? epidemic outbreak of sore throat" to possible infection through milk.

Sub-Group D.—Precautions taken to safeguard the *Source* of the milk supply, but no special treatment of the milk on the school premises prior to distribution:—Seven schools, Nos. 7, 8, 11, 15, 19, 32, 37. One draws its supply from a source subject to the school's own supervision; 3 have each their own school dairy farm—and one of these also tests all the cows on its own school farm with tuberculin; 2 draw their supplies from "general" sources, subject, in each case to inspection by the school authorities.

No doubt a desirable addition to these precautions would be the conveyance of the milk to the school in special sealed or locked cans, and the storage of the milk, when received on the school premises, in a properly constructed dairy-room. But, as it is, these 7 schools, dealing only with the milk at its source, representing some 3,291 pupils, and 22,730 yearly observations, make a return of no illness of any kind traced to milk-infection. The entrance age ranges from 10 to 12 years.

The above figures, as already pointed out, are far too limited to form the foundation of absolute conclusions. I can only hope that my analysis of the returns may help to make more clear such indications as they do suggest. In compiling the figures I have in every doubtful case tried to lean to the side of safety—*e.g.*, the pupils really stay more like 4½ years at each school, on the average, instead of 6 years: and, had the former figures been taken, the resulting percentages would have read more favourably than they do by nearly one-third. Again, in at least one large school, at which it is stated that the milk has been boiled "for some years past," I have assumed that it has been so treated throughout the thirty years covered by that return, instead of for only about half that time, as is, I believe, really the fact. But our object is, not to "make a case," but, as far as may be, to ascertain—approximately, at all events—what are the facts. The suggestion is ventured that, in con-

sidering the results of this inquiry, we may most usefully concern ourselves not so much with the relative values of different methods of attaining the sterilisation of milk, but should address ourselves mainly to the two practical questions —(1) What light does the evidence we have obtained throw upon the sufficiency or otherwise of simple practicable precautions applied to safeguarding the *sources* of school milk supplies? (2) How far does this evidence supply us with an answer to our supposititious Head Master?

C. E. S.

December, 1905.

UNWIN BROTHERS, LTD., PRINTERS, 27 PILGRIM ST., E.C.